

Autonomy and Turnover: A Survey Applied to Distributed Software Teams

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Abstract: Distributed teams have gained prominence in software companies. However, studies indicate that Distributed Software Development (DSD) companies often face challenges related to high developer turnover. Conversely, other research suggests that autonomy and its associated factors can mitigate or prevent such turnover. This study investigates the relationship between autonomy and turnover within DSD teams. To accomplish this, we conducted a survey based on previous Systematic Literature Review (SLR) research involving 181 software engineers worldwide. Our findings shed light on the key autonomy factors that impact turnover in DSD projects, including recognition, communication, collaboration, trust, and task balance. By offering a comprehensive understanding of these autonomy factors, our study provides software companies and organizations with valuable insights for addressing the issue of turnover in DSD projects.

1 INTRODUCTION


Software development has become a pivotal driver of innovation and business growth in today's globalized economies and interconnected markets. Organizations increasingly adopt a Distributed Software Development (DSD) model to harness diverse talent, optimize costs, and achieve faster time-to-market (Marinho et al., 2018). DSD allows companies to leverage expertise from different geographical locations, fostering collaboration among distributed teams (Marinho et al., 2019). However, managing DSD teams poses unique challenges, including the dynamic interplay between autonomy, turnover, and project success (Bass et al., 2018).


Autonomy could be defined from different perspectives, such as individual autonomy, internal and external autonomy, where external autonomy is defined as the influence of management and other individuals outside the team on the team's activities. Internal autonomy refers to the degree to which all team members jointly share decision authority, while individual autonomy refers to the freedom and discretion an individual has in carrying out assigned tasks (Moe


et al., 2021).

According to Fitzgerald *et al.* (Fitzgerald et al., 2017), high levels of team autonomy in DSD can foster creativity, initiative, and ownership, enabling teams to adapt quickly to local challenges and opportunities. On the other hand, the issue of turnover within DSD teams, encompassing the addition or departure of team members, presents a substantial hurdle. The dispersed structure of such teams can magnify the impact of turnover due to communication and coordination complexities. Employee attrition can potentially be highly disruptive, resulting in the erosion of knowledge, diminished team unity, and heightened project vulnerability (Massoni et al., 2019).

In this study, we aim to investigate the relationship between autonomy and turnover within DSD teams, considering the perceived impacts of this relationship. To achieve this, we have designed a survey based on a systematic literature review (Chaves et al., 2022) that we have previously conducted. The survey aims to provide a broader understanding of autonomy-turnover dynamics by addressing the following research questions: (RQ01) *How do software engineers within DSD teams perceive autonomy?* (RQ02) *What do software engineers perceive as these teams' most significant turnover motivators?* and (RQ03) *How does autonomy impact turnover within DSD teams?*

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By exploring the interplay between autonomy and turnover within DSD teams, our study aims to contribute to a better understanding of these complex dynamics. The findings have practical implications for organizations, offering insights into the perceived autonomy factors and turnover motivators that influence software engineers in distributed settings. Ultimately, this research aims to provide valuable knowledge that can assist software companies in addressing the challenges associated with turnover in DSD teams.

Our study is organized as follows: in Section 2, we introduce the background. Section 3 describes the method to design this survey. Section 4 displays the gathered results from participants. Then, Section 5 presents discussions about results and literature. Section 6 presents the limitations of our study, Section 7 highlights our conclusion and possible further investigations. Yet, in Section 7 we also have our Survey protocol available.

2 BACKGROUND

2.1 Autonomy

Autonomy, a pivotal aspect of work design and motivation, has been scrutinized in research (Noll et al., 2017). Initially, autonomy was synonymous with the extent of freedom and independence granted to team members during project execution (Hackman and Oldham, 1976). Subsequent investigations (Bass et al., 2018; Marinho et al., 2021) expounded upon this concept, highlighting its connection to traits such as decision-making authority, freedom, and the ability to shape work routines and methodologies.

Autonomy's significance extends to DSD, where professionals contend with unique challenges (Marinho et al., 2018). In this context, autonomy is both a motivator and a potential source of dissatisfaction. Its absence can amplify the need for autonomy and increase dissatisfaction, possibly leading to turnover (Bass et al., 2018). For software engineers operating within distributed models, autonomy emerges as a critical motivational factor, particularly given the demands of antisocial work hours and travel (Noll et al., 2017).

The relationship between autonomy and turnover intention within DSD teams has been a subject of inquiry (Dysvik and Kuvaas, 2013). Furthermore, the lack of autonomy has been identified as a potential contributor to decreased job satisfaction among software engineers, which may ultimately lead to turnover (Noll et al., 2017).

2.2 Turnover

The disruptive effects of team member turnover on software development processes are widely acknowledged. Although some experts acknowledge turnover as a natural organizational process, its excessive occurrence affects process efficiency adversely (Bass et al., 2018). This recognition underscores the criticality of managing turnover within software development teams.

Turnover can be categorized as either external or internal. In external turnover, team members exit the organization entirely, while internal turnover involves members remaining within the company but altering their roles (Chatzipetrou et al., 2018). Voluntary turnover occurs when employees opt to leave their positions and the company, whereas involuntary turnover transpires when organizations terminate employee contracts (Chatzipetrou et al., 2018).

Organizations often calculate turnover rates by dividing the number of departures within a specific timeframe by the total workforce during that period to gauge turnover. However, more comprehensive and nuanced data is essential for effective strategy formulation. This data, highlighting the underlying reasons for turnover, is a crucial asset for creating strategies that effectively manage and mitigate the consequences of turnover (Chatzipetrou et al., 2018). In the context of DSD teams, turnover risk is accentuated due to physical distance, further magnifying its importance as one of the foremost risks in DSD ventures (Ebert et al., 2016).

2.3 Distributed Software Development (DSD)

A distributed project is a collaborative effort where individuals from different locations work together on a single project over an extended period. This type of software project, which involves human resources spread across different distances, regions, or even countries, is known as Distributed Software Development (DSD) (Marinho et al., 2019).

DSD can be classified based on two factors. First, the distance among work teams is categorized as Onshore (within the same country) or Offshore (in different countries). Second, the control relationship the central organization has over the remote teams distinguishes it as either Outsourcing (involving the hiring of a third-party company) or Insourcing (establishing a remote unit within the company) (Bass et al., 2018).

Research suggests that offshore outsourcing service providers can mitigate staff turnover by prioritizing work-life balance and implementing more

family-friendly employment policies, such as granting increased autonomy. Furthermore, these service providers can effectively incentivize innovation and structure contracts to enhance software product ownership, ultimately improving staff retention (Bass et al., 2018).

3 METHOD

3.1 Survey Design

The basic idea of survey methodology is to collect information from a group of people by sampling individuals from a large population. Examples of surveys are found in daily life in several situations, such as election polls, market surveys, etc. There is a large amount of literature on the general methodology (Linaker et al., 2015).

Therefore, this survey based its assumptions and questions on results gathered by previously executed SLR (Chaves et al., 2022) and aimed to assess the perception of turnover, autonomy, and their relationship among other related factors within DSD teams such as payment, growth opportunity, work-life balance, collaborative environment, good communication, supervisor support, stress, motivation, good and active leadership, freedom for decision making, connection with co-workers, the balance of tasks, satisfaction, clear career orientation.

This survey was divided into four subsections. Initially, three fundamental questions were displayed, aiming at a certain level of participant evaluation and their distributed teams' autonomy. They all were stated using the 5-point Likert scale where one means 'Strongly disagree' and five means 'Totally agree'.

In the second section, there was a goal to identify turnover-related results. Therefore, for this section, it was possible to have questions more focused on turnover intentions and what could be improved inside DSD teams and questions focused on impacts generated by turnover in DSD teams. Furthermore, this section was designed with open questions and classification ones.

The third section displayed open questions and affirmative statements using the 5-point Likert scale, such as in the first section. Participants evaluated those questions and statements for further analysis to check the relationship between autonomy and turnover/turnover intentions.

Ultimately, the study's demography perspective was addressed with questions intended to collect participant's gender, age, work experience, education, role, team distribution, and company size.

3.2 Setting

This study aimed to collect data on turnover and autonomy within DSD teams. A web survey was conducted using the Google Forms tool to achieve this. A pilot session involving three software engineers was conducted to ensure the survey's quality, readability, and validity. Their feedback was invaluable in addressing any shortcomings and refining statements and questions.

In addition to the pilot session, multiple web platforms distributed the survey to participants, including LinkedIn, Twitter, WhatsApp, email, and Instagram. Despite the time constraint – the survey was conducted from August 20th to September 30th – a substantial response was achieved. 181 participants completed the survey, excluding the three from the pilot phase. This strong response underscores the survey's effectiveness even within a limited timeframe. The paper reports a qualitative study on the relationship between autonomy and turnover within DSD teams. Therefore, no statistical power is required.

3.3 Participants

The 181 participants previously mentioned were mostly software developers, testers, scrum masters, project managers and leaders, technology leaders, security analysts, UX/UI designers, software architects, data scientists, etc. They all had at least one person from their teams working in a distributed environment.

3.4 Analysis

Yet, for the data analysis procedure, the author chose a qualitative approach where all collected data was extensively analyzed, generating perceptions stored in a spreadsheet, which was later on translated into charts, tables, and quotes, constructing parallelisms by engaging in triangulation to support arguments and conclusions for this study (Linaker et al., 2015).

4 RESULTS

4.1 Study Population

The survey yielded complete answers from software engineers involved in the software development life cycle regarding autonomy, turnover, and their relationship inside distributed environments, with 85 participants (47%) working remotely inside Brazil, 76

participants (42%) working with other software engineers globally located, 13 participants (7%) who worked with team members from the same continent and 7 participants (3%) working in locally distributed teams within the same city or state.

Most of the identified participants were men (69.1%), some were women (28.7%) and completing the total number of participants, there were 1.1% non-binary and 1.1% of not identified gender.

87.3% of the participants were found to work in a large company, 3.9% worked in a small company, 6.1% worked in a medium company and 2.8% worked in a micro company. Furthermore, a range of experience in the software development area were stated amongst them ranging from less than 1 year (6), through 1-5 years (92), 6-10 years (36), 10-15 years (22) to more than 15 years (14). Yet, 54.1% of the participants were software developers, 22.7% were testers, 5.5% were software architects, 4.4% were requirements engineers and the rest of them were split among management/leadership roles, UX/UI, Scrum Masters, trainees and other roles.

4.2 RQ01. How Do Software Engineers Within DSD Teams Perceive Autonomy?

It was possible to notice a pretty well-balanced collected data where 50 (27.6%) participants stated that they did not know whether their work was being strongly monitored or not, while 63 (34%) declared there is at least some strong monitoring of their work and 68 (37%) of the participants informed there is few monitoring within their work in software development cycles.

Regarding teams having a shared purpose, clear goal, necessary skills, and mutual trust among peers, 160 (88.3%) participants agreed at least partially to it. In contrast, only 12 participants (6.6%) denied it, and the other nine stated they did not know whether this happened within their teams.

Yet, results show that 156 (86.1%) participants agree they have at least some healthy support and freedom to make decisions provided by managers and leaders. On the other hand, 12 participants (6.6%) denied it, and 13 stated not knowing about any support or freedom from leadership members.

4.3 RQ02. Which Turnover Motivators Are the Most Perceived for Software Engineers Within DSD Teams?

To assess the causes and mitigation factors of turnover within distributed teams, we presented a section to the participants regarding this matter with questions and statements.

According to results, 85.5% of all 181 participants stated they have already decided to leave a project or job, while 14.5% of them have never been through such an experience.

Participants could also select the most critical factors in deciding whether to leave a project or company. The outcomes revealed a ranking of perceived factors such as payment, stress, lack of motivation, the mismatch between expectation and reality, lack of motivation, lack of supervisor support, long working hours, lack of satisfaction, poor communication among peers, lack of freedom for decision making and lack of connection with co-workers as can be seen on Table 1.

Table 1: Most important factors to leave a project or company according to participants ($n=181$).

Option	#	%
Payment	145	80
Stress	130	72
Lack of motivation	112	62
Mismatch between expectations and reality	106	59
Lack of collaboration among the team	101	56
Lack of supervisor support	97	54
Long working hours	92	51
Lack of satisfaction	88	49
Lack of connection with co-workers	73	40
Lack of freedom for decision making	73	40

On the other hand, participants could select the factors they considered the most important in deciding whether to stay in a project or company. Based on their answers, another ranking was lightened with perceived factors such as payment, growth opportunity, work-life balance, collaborative environment, good communication, supervisor support, motivation, good and active leadership, freedom for decision making, connection with co-workers, the balance of tasks, satisfaction, clear career orientation, all team members feeling involved, organizational commitment, workplace innovation, and employment policies as can be seen on Table 2.

Yet, 90.4% of them declared they had already been to a distributed project or company where a software engineer left, while 9.5% stated this never happened before. Also, all participants stated the most common outcomes after a person leaves a project or com-

Table 2: Most important factors to staying in a project or company according to participants ($n=181$).

Option	#	%
Payment	158	87
Growth opportunity	153	85
Work-life balance	143	79
Collaborative environment	136	75
Good communication	119	66
Supervisor support	115	64
Motivation	110	61
Good and active leadership	107	59
Freedom for decision making	102	56
Connection with co-workers	101	56
Balance of tasks along development cycles	93	51
Satisfaction	90	50
Clear career orientation	79	44
All team members feeling involved	73	40
Organizational commitment	67	37
Workplace innovation	50	28
Employment policies	24	13

Table 3: Most important outcomes after a software engineer leaves a project or company according to participants ($n=181$).

Option	#	%
Loss of knowledge and experience	154	85
Lower levels of productivity	78	43
Software quality	57	31
Lack of commitment and mutual trust among peers	41	23
Economic loss to companies	28	15
Better conditions and performance for those who remain	24	13
Fresh and innovative ideas	18	10
Unsuccess of software project	17	9
Project success	8	4

pany the participant is still a part of. Those outcomes were also brought up in a ranking and contained items such as lower levels of productivity, project success, loss of knowledge and experience, software quality, better conditions and performance for those who remain, economic loss to companies, lack of commitment, and mutual trust among peers, fresh and innovative ideas, software project unsuccessful as can be seen in Table 3.

4.4 RQ03. How Does Autonomy Impact Turnover Inside DSD Teams?

Our study delved into the intricate relationship between autonomy and turnover as perceived by our participants. Initially, we questioned whether a higher level of autonomy within distributed projects was a key factor influencing one’s willingness to stay or leave, and the results showed that 69.8% of participants agreed, while 30.2% did not. To gain deeper insights, we explored how participants in different career stages perceived autonomy. We invited them

to share their real experiences, focusing on moments when they were granted autonomy early in their careers or as more experienced professionals.

During early career stages, participants reported several positive outcomes associated with autonomy. *Trust* was a significant theme, as many felt trusted by their team members, which fostered their growth and development. *Recognition* also flourished, with participants taking on more responsibilities and feeling acknowledged for their skills. Autonomy was seen as a catalyst for improved *communication* and *collaboration*, even when individuals had limited knowledge. *Support from more experienced engineers* played a pivotal role, acting as mentors and guiding less experienced team members. Furthermore, autonomy was motivating, making participants feel valued and inspired.

However, it was not all positive. Some participants shared initial feelings of *anxiety*, *fear*, and *insecurity* when granted autonomy. These negative emotions often dissipated over time as they gained experience and received support from their colleagues.

In contrast, participants in more advanced stages of their careers emphasized the importance of autonomy in decision-making. They valued the *freedom to choose the best approaches* for their tasks. With autonomy came increased *accountability*, leading to professional growth and *satisfaction*, although some experienced initial nervousness. Autonomy consistently correlated with professional growth, whether during task execution or afterward. Even though autonomy was highly regarded, participants acknowledged the ongoing need for communication and collaboration within their teams. Trust played a dual role—trust from the team to grant autonomy and trust among more experienced engineers to promote autonomy within the team.

Moreover, we presented seven statements to gauge participants’ perceptions of autonomy and its link to turnover intentions using a Likert scale. The findings revealed that most participants believed that having the freedom to work as they preferred heightened their motivation, satisfaction, and willingness to remain in a project or company. Surprisingly, a lack of competence was not significantly associated with stress and turnover intentions when autonomy was present. Instead, participants viewed challenges as opportunities for personal and professional growth. Autonomy also positively influenced task control, quality, and team connections. Participants tended to choose challenging tasks when given the option, leading to increased delight in their work. Autonomy fostered individual trust and commitment to team goals, boosting engagement and potentially reducing turnover.

Interestingly, many participants preferred working in a quiet environment when handling complex tasks autonomously, as it reduced exhaustion. This preference for solitude was not necessarily a drawback, especially in distributed work environments. Lastly, participants generally favored tasks related to new products or innovative ideas over support or legacy items, signaling higher engagement and the potential for reduced turnover rates within software teams.

5 DISCUSSION

Autonomy and turnover have been widely discussed in previous researches (Lin et al., 2017; Noll et al., 2017; Chaves et al., 2022; Marinho et al., 2021) separately and usually linked to some factors such as motivation, satisfaction, happiness, communication, collaboration, and many others. In our work, we addressed the perception about the relationship between them.

Most software engineers believe the organization is becoming too intrusive of their private space, and many would want to disassociate themselves from employment entirely and set up their businesses instead, just to be able to exercise their freedom (Uzoka et al., 2011). Freedom for decision-making has been cited in our results as one of the most important factors linked to autonomy in distributed teams, especially for those more experienced software engineers, but there was no indication of disassociation with companies. Instead, there were many indications that this freedom is strongly linked to trust and accountability. This mutual trust among peers and sense of accountability enables them to share more activities, consequently fostering them to share information so everyone has the knowledge to influence decisions (Robert Jr and You, 2018; Lundene and Mohagheghi, 2018).

This connection among peers has already been identified as both good and bad regarding turnover intentions as it may retain software engineers working together for a longer period (Bass et al., 2018) but on the other hand, it may become an influence for higher turnover as the career moves of co-workers strongly influence individuals in attempts to define security, stability, and career success (Moe et al., 2021).

Even though autonomy is not a problem for those working remotely as it can work independently as a pre-requisite (Noll et al., 2017), it's also found to have a strong link to communication inside distributed software teams (Noll et al., 2017). Yet, a lack of adequate communication inside a company is commonly related to low levels of commitment and high turnover

levels (Noll et al., 2017). In our study, we could identify the need for communication stated by those software engineers who have been given autonomy at the workplace in different career stages. Also, good communication is an important factor in staying in a distributed software team. Therefore, it supports the vision brought by Bass *et al.* (Bass et al., 2018) where poor communication is related to a lot of tension and pressure, which may lead to stress; this stress can have a considerable impact on organizational commitment and turnover levels (Yener et al., 2020; Hynninen et al., 2010).

Collaboration reduces workplace tension and stress levels among the team (Bass et al., 2018). A collaborative environment is an important factor for participants' decision to stay in a project. When collaboration is lacking, it can lead to workload imbalances and potentially increase project turnover (Bao et al., 2017). Experienced participants in our study mentioned that autonomy can result in task overload due to increased accountability. Lack of collaboration can also impact early-career software engineers who rely on support from senior colleagues for skill development (Noll et al., 2017). Additionally, lack of collaboration can affect work estimation, management, and team environment, influencing retention (Bass et al., 2018). Our results indicate that lack of collaboration significantly influences participants' inclination to leave a project or company.

However, recognition was a positive outcome mentioned by participants who have experienced autonomy as they feel valued and involved. Autonomy, pay level, promotional chances, and social support are suggested to be positively related to organizational commitment and thus reduce the likelihood of voluntary turnover (Hynninen et al., 2010) while according to Uzoka *et al.* (Uzoka et al., 2011), good payment and promotion can be considered a kind of recognition for the services provided, and they influence the intention to leave. Our work indicates that it is not only payment is related to turnover intentions but also to turnover retention.

This perception is quite well aligned with the appreciation for challenges stated in (Remus et al., 2016), and it indicates the positive impact on job and career satisfaction after opportunities for career development, promotions, and training opportunities (Uzoka et al., 2011). Therefore, even though payment is identified as a factor linked to turnover, autonomy can be considered a factor that leads to professional growth opportunities, motivation, and satisfaction, which can be as important as payment.

Yet, other factors linked to autonomy and turnover are present, such as growth opportunities and motiva-

tion. Some participants have stated that the autonomy received by them acted as a motivator during working days and also flourished professional growth opportunities after challenges had been overcome. This view matches prior research where autonomy has been reported to have a positive impact on job satisfaction and as a general motivator for software developers, while job satisfaction has been found to have a significant impact on turnover intentions as workers who have high job satisfaction are less likely to leave (Lin et al., 2017; Bass et al., 2018).

Nevertheless, lack of motivation has been emphasized as a correlated factor with reported intentions to leave by prior research related to turnover among IS professionals (Bass et al., 2018) as tapping into the intrinsic motivation needs of the software engineer correlates to desirable outputs such as low staff turnover, higher productivity, and better quality software (Noll et al., 2017).

Our work also shows that autonomy received in an early career has been stated to depend on support from more experienced engineers or leadership, and this is compliant with recent works where lack of supervisor/management support is perceived as an influence on software engineer's turnover and dissatisfaction (Uzoka et al., 2011; Robert Jr and You, 2018). Also, autonomy is encouraged once this management support is facilitated effectively, fostering an environment of trust and a culture of valuing individuals (Marinho et al., 2021). Yet, organizational support with guidance and certification programs significantly reduces turnover intention (Chaves et al., 2022).

6 LIMITATIONS

Our study has some limitations that will be presented in this section. We used a qualitative perspective based on perceptions from participants, and it's important to be aware of different contexts, environments, and individuals. Therefore, all data analysis was based on this evidence, and we cannot state all results match the full picture regarding autonomy and turnover and distributed software development teams. Furthermore, all data and classifications presented in this paper must be treated carefully, as we only provide indications.

Our survey was applied to 181 participants over two months, revealing time as a limitation. We encourage new research to take place during a longer period. There was no deep statistical evaluation with known models to address the relationship between the cited factors in this paper. Therefore, we also suggest this approach be taken in further studies.

7 CONCLUSIONS

Our study focuses on the relationship between autonomy and turnover within Distributed Software Development (DSD) teams. We have gathered valuable insights from real software engineers working in DSD teams. Our study findings confirm that autonomy is linked to turnover and turnover intentions, with various factors influencing this relationship. Effective communication, collaboration, trust, recognition, and task balance influence how autonomy impacts turnover among software engineers of different experience levels.

For early-career software engineers, providing autonomy can lead to feelings of anxiety, insecurity, and fear, which may result in lower commitment and increased turnover intentions. This highlights the importance of support from more experienced engineers, leaders, and managers in providing guidance and mentorship. On the other hand, experienced software engineers are better equipped to handle autonomy without experiencing adverse outcomes. However, task overloading becomes a concern for them, as increased accountability may lead to stress and an unbalanced working routine, potentially leading to a turnover.

Regardless of experience level, the perception of autonomy as beneficial for software engineers is contingent upon effective communication, collaboration, and mutual trust among team members in the work environment.

Recognition plays a crucial role in sustaining the benefits of autonomy. Companies should establish practices to acknowledge and reward software engineers for achieving goals through their granted autonomy. Recognition, particularly when tied to salary increases or bonuses, is valuable and can reduce turnover intentions.

Lastly, our study highlights the perceived outcomes for projects or companies when one or more software engineers leave. Loss of knowledge and decreased productivity were identified as the primary consequences. Further investigations are recommended to understand and address these issues.

In conclusion, our study sheds light on the relationship between autonomy and turnover in DSD teams, emphasizing the significance of communication, collaboration, trust, recognition, and balancing task responsibilities. Understanding and effectively managing autonomy can create a positive work environment and reduce turnover intentions among software engineers.

REFERENCES

- Bao, L., Xing, Z., Xia, X., Lo, D., and Li, S. (2017). Who will leave the company?: a large-scale industry study of developer turnover by mining monthly work report. In *2017 IEEE/ACM 14th International Conference on Mining Software Repositories (MSR)*, pages 170–181. IEEE.
- Bass, J. M., Sarah, B., Razzak, M. A., and Noll, J. (2018). Employee retention and turnover in global software development: Comparing in-house offshoring and offshore outsourcing. In *2018 IEEE/ACM 13th International Conference on Global Software Engineering (ICGSE)*, pages 77–86. IEEE.
- Chatzipetrou, P., Šmite, D., and Van Solingen, R. (2018). When and who leaves matters: emerging results from an empirical study of employee turnover. In *Proceedings of the 12th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement*, pages 1–4.
- Chaves, A., Amorim, L., Marinho, M., de Farias Júnior, I., and Moura, H. (2022). Autonomy and turnover in distributed software development projects: a systematic literature review. In *Anais do XXV Congresso Ibero-Americano em Engenharia de Software*, pages 105–119. SBC.
- Dysvik, A. and Kuvaas, B. (2013). Perceived job autonomy and turnover intention: The moderating role of perceived supervisor support. *European Journal of Work and Organizational Psychology*, 22(5):563–573.
- Ebert, C., Kuhrmann, M., and Prikladnicki, R. (2016). Global software engineering: Evolution and trends. In *2016 IEEE 11th International Conference on Global Software Engineering (ICGSE)*, pages 144–153. IEEE.
- Fitzgerald, B., Stol, K.-J., Minör, S., and Cosmo, H. (2017). *Scaling a software business: the digitalization journey*. Springer Nature.
- Hackman, J. R. and Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational behavior and human performance*, 16(2):250–279.
- Hynninen, P., Piri, A., and Niinimäki, T. (2010). Off-site commitment and voluntary turnover in gsd projects. In *2010 5th IEEE International Conference on Global Software Engineering*, pages 145–154. IEEE.
- Lin, B., Robles, G., and Serebrenik, A. (2017). Developer turnover in global, industrial open source projects: Insights from applying survival analysis. In *2017 IEEE 12th International Conference on Global Software Engineering (ICGSE)*, pages 66–75. IEEE.
- Linaker, J., Sulaman, S. M., Höst, M., and de Mello, R. M. (2015). Guidelines for conducting surveys in software engineering v. 1.1. *Lund University*, 50.
- Lundene, K. and Mohagheghi, P. (2018). How autonomy emerges as agile cross-functional teams mature. In *Proceedings of the 19th International Conference on Agile Software Development: Companion*, pages 1–5.
- Marinho, M., Amorim, L., Camara, R., Oliveira, B. R., Sobral, M., and Sampaio, S. (2021). Happier and further by going together: The importance of software team behaviour during the covid-19 pandemic. *Technology in society*, 67:101799.
- Marinho, M., Noll, J., and Beecham, S. (2018). Uncertainty management for global software development teams. In *11th International Conference on the Quality of Information and Communications Technology*, pages 238–246, Coimbra, Portugal. IEEE.
- Marinho, M., Noll, J., Richardson, I., and Beecham, S. (2019). Plan-driven approaches are alive and kicking in agile global software development. In *International Symposium on Empirical Software Engineering and Measurement (ESEM)*, pages 1–11, Porto de Galinhas, Brazil. IEEE.
- Massoni, T., Ginani, N., Silva, W., Barros, Z., and Moura, G. (2019). Relating voluntary turnover with job characteristics, satisfaction and work exhaustion—an initial study with brazilian developers. In *2019 IEEE/ACM 12th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE)*, pages 85–88. IEEE.
- Moe, N. B., Šmite, D., Paasivaara, M., and Lassenius, C. (2021). Finding the sweet spot for organizational control and team autonomy in large-scale agile software development. *Empirical Software Engineering*, 26(5):101.
- Noll, J., Beecham, S., Razzak, A., Richardson, B., Barcomb, A., and Richardson, I. (2017). Motivation and autonomy in global software development. In *International Workshop on Global Sourcing of Information Technology and Business Processes*, pages 19–38. Springer.
- Remus, U., Wiener, M., Saunders, C., Mähring, M., and Kofler, M. (2016). Control modes versus control styles: Investigating isd project control effects at the individual level.
- Robert Jr, L. P. and You, S. (2018). Are you satisfied yet? shared leadership, individual trust, autonomy, and satisfaction in virtual teams. *Journal of the association for information science and technology*, 69(4):503–513.
- Uzoka, F.-M. E., Mgya, K. V., Shemi, A. P., Kitindi, E. G., and Akinnuwesi, B. A. (2011). Stay or quit: It personnel turnover in botswana. In *Proceedings of the 49th SIGMIS annual conference on Computer personnel research*, pages 97–106.
- Yener, S., Arslan, A., and Kiliç, S. (2020). The moderating roles of technological self-efficacy and time management in the technostress and employee performance relationship through burnout. *Information Technology & People*.

APPENDIX - QUESTIONNAIRE

The applied survey questions and statements can be accessed through this link: <https://bit.ly/437WqYY>.